

SEQUENCE LISTING

- <110> Mitsukan Group Corporation
 <120> Structural gene responsible for high temperature tolerance in acetic acid bacteria, acetic acid bacteria transformed with said gene, and acetic acid fermentation using said transformants.
 <130>
 <141> 2003-12-04
 <160> 7
 <210> 1
 <211> 1313
 <212> DNA
 <213> *Gluconacetobacter entanii*
 <400> 1

```

gaagagtgat attacattc cctgacgccg ttttctaatt tgctccatac gcgggacctt   60
gccggaaaga taatgtctgt ttccaacgt cttgtttcac ccgccggact ggccgcgacc   120
gttgcggtcg ccgggtgcat gcaggcagcg cttggcactt ttctggcttc gcgtttccgg   180
tggcaggaaa aacgcattga ccgggcggtg cccatgcctc cggtttccgt gctcaagccc   240
ctccacggcg atgaaccgt gctggaggaa gcgcttgaaa gcttctgcac gcaggattac   300
ccgcagatgc agatgtctt tggcgtacag gccgaagacg atgcggcgat cccgatcgta   360
caacggttga tggaaaccca cccggatgtg cagatggaac tggatgattga cccacattc   420
cacgggtca accgcaagat cggcaacctg atcaacatca tgacgcgct gaagcatgat   480
gtccttggtc tttccgattc ggatatccac gttgccccg attacctgcg gcatgtggtg   540
ggcgccatgg tgcccacaa tctcgccctg gtcacgacgc tgtacgcggg gctgcccgcg   600
tcatccacgc tgccgcgct gctggccgca tgccagatca accataactt cctgcccggc   660
gtgatgctgt cactctacct cgggcggcag gactgccttg gggcgacaat ggcgctgcgg   720
cgttccatgc tggacgaaat cggcgggctg gaagccctcg tgccgatgt ggccgatgat   780
gcgatactgg gccgttacgt gcgtgacct ggcaaggata tcgccattgc cgcgtgcatg   840
acctggacca ccgtgggcga gacctcgatg cgtgaggtgc tggcgcatga actgcgtgg   900
ggccggaccg tcaagacgt ggagcctgcg ggttatgcc catccgcat ccagctgccc   960
ctgttctggg ccagcgtcgc cgtgcttgcc gcgccgatg cgacctggac atggtcttc   1020
tttcttggtg catgggatg gcgggccgtg tgttcctca tcctggaccg tacgtggcg   1080
caacgtagtc tggctgtgcc gtcactgctt ctgccactgc gcgactggat ctcggccgcc   1140
gtcatggtgg gcagtgcac tggcacgcgg gttgcatggc gtgggcagac aatgcatgtc   1200
acgccccatt cggtcatgac accacgatcg caaccggctt cccccgtga ctgaccgcc   1260
gtcagcaggc tgaactgctt gagaattcca accctgtcgt taataagaac ggg       1313

```

<210> 2
 <211> 393
 <212> PRT
 <213> Gluconacetobacter entanii
 <400> 2

Met	Ser	Val	Phe	Asn	Ala	Leu	Val	Ser	Pro	Ala	Gly	Leu	Ala	Ala	Thr
				5					10					15	
Val	Ala	Val	Ala	Gly	Cys	Met	Gln	Ala	Ala	Leu	Gly	Thr	Phe	Leu	Val
			20					25					30		
Ser	Arg	Phe	Arg	Trp	Gln	Glu	Lys	Arg	Met	Asp	Arg	Ala	Val	Pro	Met
		35					40				45				
Pro	Pro	Val	Ser	Val	Leu	Lys	Pro	Leu	His	Gly	Asp	Glu	Pro	Leu	Leu
		50				55					60				
Glu	Glu	Ala	Leu	Glu	Ser	Phe	Cys	Thr	Gln	Asp	Tyr	Pro	Gln	Met	Gln
	65				70					75				80	
Ile	Val	Phe	Gly	Val	Gln	Ala	Glu	Asp	Asp	Ala	Ala	Ile	Pro	Ile	Val
			85						90				95		
Gln	Arg	Leu	Met	Glu	Arg	His	Pro	Asp	Val	Gln	Met	Glu	Leu	Val	Ile
		100						105				110			
Asp	Pro	Thr	Phe	His	Gly	Leu	Asn	Arg	Lys	Ile	Gly	Asn	Leu	Ile	Asn
		115					120					125			
Ile	Met	Thr	Arg	Val	Lys	His	Asp	Val	Leu	Val	Ile	Ser	Asp	Ser	Asp
	130					135					140				
Ile	His	Val	Ala	Pro	Asp	Tyr	Leu	Arg	His	Val	Val	Gly	Ala	Met	Val
	145				150					155				160	
Pro	Asp	Asn	Val	Gly	Leu	Val	Thr	Thr	Leu	Tyr	Ala	Gly	Leu	Pro	Ala
			165						170				175		
Ser	Ser	Thr	Leu	Pro	Arg	Leu	Leu	Ala	Ala	Cys	Gln	Ile	Asn	His	Asn
		180					185					190			
Phe	Leu	Pro	Gly	Val	Met	Leu	Ser	Leu	Tyr	Leu	Gly	Arg	Gln	Asp	Cys
		195					200					205			
Leu	Gly	Ala	Thr	Met	Ala	Leu	Arg	Arg	Ser	Met	Leu	Asp	Glu	Ile	Gly
	210						215					220			
Gly	Leu	Glu	Ala	Leu	Val	Pro	His	Val	Ala	Asp	Asp	Ala	Ile	Leu	Gly
	225				230					235				240	
Arg	Tyr	Val	Arg	Asp	Arg	Gly	Lys	Asp	Ile	Ala	Ile	Ala	Ala	Cys	Met
			245						250				255		
Thr	Trp	Thr	Thr	Val	Gly	Glu	Thr	Ser	Met	Arg	Glu	Val	Leu	Ala	His
			260						265				270		

Glu Leu Arg Trp Gly Arg Thr Val Lys Thr Leu Glu Pro Ala Gly Tyr
 275 280 285
 Ala Ala Ser Ala Ile Gln Leu Pro Leu Phe Trp Ala Ser Val Ala Val
 290 295 300
 Leu Ala Ala Pro His Ala Thr Trp Thr Trp Ser Phe Phe Leu Gly Ala
 305 310 315 320
 Trp Gly Trp Arg Ala Val Cys Ser Phe Ile Leu Asp Arg Thr Leu Ala
 325 330 335
 Gln Arg Ser Leu Val Leu Pro Ser Leu Leu Leu Pro Leu Arg Asp Trp
 340 345 350
 Ile Ser Ala Ala Val Met Val Gly Ser Val Thr Gly Thr Arg Val Ala
 355 360 365
 Trp Arg Gly Gln Thr Met His Val Thr Pro His Ser Val Met Thr Pro
 370 375 380
 Arg Ser Gln Pro Ala Ser Pro Gly Asp
 385 390 393

<210> 3
 <211> 30
 <212> DNA
 <213> Artificial Sequence
 <400> 3
 gaagagtgat attacacttc cctgacgccg

<210> 4
 <211> 26
 <212> DNA
 <213> Artificial Sequence
 <400> 4
 cccgttctta ttaacgacag ggttgg

<210> 5
 <211> 5734
 <212> DNA
 <213> Gluconacetobacter entanii (Acetobacter altoacetigenes MH-24)
 <400> 5

catggggcgt cacccccagc ggccagcttg gctacctgat ggacagggcg ggccttctgc	60
aagccctcgg ccactgccat ctgccgggat atgaggccaa atacgaaccg aaggaaaagc	120
gcaccttctg ctaccccacc cagaacgcc a gcggtgggc tgtgcagcca tgatcgccaa	180
ccccccctc ttcttgagca attcggaaga gcgatttccg ccgactgaac acgtcgaaaa	240
tggcagtttt ccaccgaaaa aaggaaagga ccataggaaa ggattaatat cttatittta	300
tctaggggtt tgccgatccg cgattttcgc tgggaaaccg ccaaaaatgg ctigccatta	360
ggtcgcacca catgcgacca taaagtcga cagtgtcga cctatcggc ccatatacag	420
aggttcccca catgcggaat gtcacccgtc tcaagaccg caaagaccg ctccgcgagg	480
accaagccga cctgttgaag caagcccttc tgccttctgc agaggacgat ggaccgatgc	540
gggatgcggt cggacggctc tacgtccaga tcaagaacct caccaccca gaccccgaa	600
ccacggagcc gtctgtcatg atccgtccg ccagaaatcg cgcgctacc ctctggctgc	660
tgaagaacag taagcgccc atgaaggccg tggacgtatg gacgtgtg ttcgaccacc	720
tgtttcccca taccggccag atcatgtga cccgtgagga aatcgcgaa aaagtcggta	780
tccgggtcaa cgaagttaca gccgtcatg acgagctggt gagcttcggc gcgattttct	840
ccgagcgca gaaggtggc ggaatgcgcg ggccgggcct cggccgtac tacatgaacc	900
ggcatgtggc cgaggtcggc agccgcgcca cgcaggaaga acttgcccta atcccacgcc	960
ccggcgccaa gctggcagtc gtgcagggtg gcaaggctta accatgaag gtttcggaac	1020
tggacgtgtt cgacagcgcc aaggcggcac aagaccgtt ggtgcgggaa gaactgtgc	1080
aagcagcga ggcggacggc cacggccccg cctcgcctca tgccgttcc gtcataacca	1140
aggcgcgggc cgggcaggac gccaaaggct aacggccccg cctctcccg cctcgatccc	1200
ggcggggctg tagcatctcc tgatgtcctt tggcgttttt ggcccgtgc tcggcccgt	1260
ctttctcggc cgtcgggt cttagcgct cttcgccag ccgatccgc tcgtccatct	1320
gacgtttccg atctgcctcg gcatccittg cggtcctgc cttcagccct ttgtgaaag	1380
ccatccactt attggcggtt ttctcggtt tctgtgtat cggcggggtc agccgggtcaa	1440
atgcctgggc caccctctcg aagccctcac gcatggcgtt gacggcctgc gccagtttag	1500
ccaggcgaa atctatcacc tcggcccgtt gggcgttctc ggcccggata cgccggttgt	1560
ggttgcgggt cggggtcttg tggcccttc gtccagagc caccacattc ggccccatgt	1620
gccgtctgg aacgcggtct agcccctgt cgcattgt cgggtgatct atccgggcct	1680
cttgcccagc ccgtctagc gcggcattgg caaggccgc ccatagctgc cggatttct	1740
tcacctcgtc ggcggccttc ccagtcacca tgccctgccg cttcttgtcg gacagttcga	1800
tggttgattt gtctccaaag gacagcttc catcgcccc ccgtccacc gtgcgggtgg	1860
tggatcatg gtgcgctga tgattccgt cgtcgccctc gtcaccgga agatgcacgg	1920
ccacgtccac ggccaccccg taccgttga ccaactcac cgcgaaactg tccgccagtt	1980
cggcccgtc ctgctgttg agttcatgag ggaggccac aaccattcc ctccgggtgc	2040
ggcgctcctt gcgtttctct gatcgtccg cgtcattcca caattccgaa cggtcagcgg	2100
tgccaccccc cgaatgaaa attgccttat gggcaacgt attctgccg gggctgtatt	2160
tgtgttcgt cccgtcaacc tcgttggtca aatcctgcc agcacgatac gcagccgcag	2220
ccacaacgga acgccctgcg ctccggctga tcggtttcgt ttctgcgca tagattgcca	2280
cggatcgagc gccctacctt tggagttaaa cgggggggtt aggggggcga agccaccatg	2340

acgcaggact tgcacttgtg caagtcgtaa ctgcgccctt aataacctgac ggcatcaagg	2400
gatatgtggt attcgittga aacggaacgg ctccacgggtg aggatgatat gagcgatatt	2460
gcgaaagaga ttgagaacgc caaaaggatc atagctgaac agaaaaagcg catcaaagat	2520
gccagaagg aagcagctaa agcggaatca aagttgagg accgtcagaa ctacatcttg	2580
ggcggcgcac tggtaaaact tgcgaaaca gatgaacggg ccgtccgcac tattgaaca	2640
cttttgaagc tgggtgatcg tccatcagac cgggaaggcgt ttgagggttt tccccgtctc	2700
ccatccctct ccttccccac gcagccagca cgggacaccg gccatgagtg aggcactgga	2760
agaagatccg tttaacttgt tcaaaagggt cgaaaaaagc ctgtccacgg ccaccgccag	2820
catggagcgg ctggccgcgg aacaagatgc caggtgcaag accatitcag acgccgccgg	2880
aaaagcctct aaattggccg aggaagccgg tgacacctc acagcatcca agaggcgtct	2940
gatgatctgg acggccctct gcgcggctct gctggtctgt ggcggttgtt tggcggttta	3000
ttggctggga caccgtgacg gttgggccctc tggcacggcc cagcagctct aagaaacat	3060
tattatcatg acattaacct ataaaaatag gcgtatcacg aggccctttc gtctcgcgcg	3120
tttcggtgat gacggtgaaa acctctgaca catgcagctc ccggagacgg tcacagcttg	3180
tcgttaagcg gatgccggga gcagacaagc ccgtcagggc gcgtcagcgg gtgttggcgg	3240
gtgtcggggc tggcttaact atgcggcatc agagcagatt gtactgagag tgcaccatat	3300
gcggtgtgaa ataccgcaca gatgcgtaag gagaaaatac cgcacaggc gccattcgcc	3360
attcaggctg cgcaactgtt gggaaggcgg atcgggtcgg gccctcttcg tattacgcca	3420
gcitggcgaag gggggaatgt ctgcaaggcg attaatgtg gtaacgccag ggttttccca	3480
gtcacgacgt tgtaaaacga cggccagtgc caagcttgca tgcctgcagg tcgactctag	3540
aggatccccg ggtaccgagc tcgaattcgt aatcatggtc atagctgttt cctgtgtgaa	3600
attgttatcc gtcacaaatt ccacacaaca tacgagccgg aagcataaag tgtaaagcct	3660
ggggtgccta atgagtgagc taactcacat taattgcgtt gcgtcactg cccgctttcc	3720
agtcgggaaa ccgtcgtgc cagctgcatt aatgaatcgg ccaacgcgcg gggagaggcg	3780
gtttgcgtat tggcgctct tccgttccct gcgtcactga ctgcgtgcgc tcggtcgttc	3840
ggctgcggcg agcggatatca gctcactcaa aggcggtaat acggttatcc acagaatcag	3900
gggataacgc aggaagaac atgtagcaa aaggccagca aaaggccagg aaccgtaaaa	3960
aggccgcgtt gctggcggtt ttccataggc tccgcccccc tgacgagcat cacaaaaatc	4020
gacgctcaag tcagagggtg cgaaaccga caggactata aagataccag gcgtttcccc	4080
ctggaagctc cctcgtgcgc tctcctgttc cgaccctgcc gcttaccgga tacctgtccg	4140
ccttttcccc ttcgggaagc gtggcgcttt ctcaatgctc acgctgtagg tatctcagtt	4200
cgggttaggt cgttcgctcc aagctgggct gtgtgcacga accccccgtt cagcccgacc	4260
gctgcgccct atccggtaac tatcgtcttg agtccaaccc ggttaagacac gacttatcgc	4320
cactggcagc agccactggt aacaggatta gcagagcgag gtatgtaggc ggtgctacag	4380
agttcttgaa gtggtggcct aactacggct acactagaag gacagtatit ggtatctgcg	4440
ctctgtgaa gccagttacc ttcggaaaaa gatttggtag ctcttgatcc ggcaaacaaa	4500
ccaccgctgg tagcggtggt tttttgttt gcaagcagca gattacgcgc agaaaaaag	4560
gatctcaaga agatcctttg atcttttcta cggggtctga cgctcagtg aacgaaaact	4620
caggttaagg gattttggtc atgagattat caaaaaggat cticacctag atccttttaa	4680

attaaaaatg aagttttaaa tcaatctaaa gtatatatga gtaaacttgg tctgacagtt	4740
accaatgcctt aatcagtgag gcacctatct cagcgatctg tctatttcgt tcatccatag	4800
ttgcctgact ccccgctcgtg tagataacta cgatacggga gggcttacca tctggcccca	4860
gtgctgcaat gataccgca gaccacgct caccggctcc agatttatca gcaataaacc	4920
agccagccgg aagggccgag cgcagaagtg gtccctgcaac tttatccgcc tccatccagt	4980
ctattaattg ttgccgggaa gctagagtaa gtagttcgcc agttaatagt ttgcgcaacg	5040
ttgttgccat tgctacaggc atcgtgggtg cacgctcgtc gtttggtatg gcttcattca	5100
gtcccggttc ccaacgatca aggcgagtta catgatcccc catgttgtgc aaaaaagcgg	5160
ttagctcctt cggctcctcg atcgttgtca gaagtaagtt ggccgcagtg ttatcactca	5220
tggttatggc agcactgcat aattctctta ctgcatgcc atccgtaaga tgcctttctg	5280
tgactgggtga gtactcaacc aagtcattct gagaatagtg tatgcggcga ccgagttgct	5340
cttgcccggc gtcaatacgg gataataccg cgccacatag cagaacttta aaagtgtca	5400
tcatlggaaa acgttcttcg gggcgaaaac tctcaaggat cttaccgctg ttgagatcca	5460
ttcgaigtga ccactcgtg caccgaactg atcttcagca tcttttactt tcaccagcgt	5520
ttcigggtga gcaaaaacag gaaggcaaaa tgccgcaaaa aagggaataa gggcgacacg	5580
gaaatgttga atactcatac tcttcctttt tcaatattat tgaagcattt atcagggtta	5640
ttgtctcatg agcggataca tatttgaatg tatttagaaa aataa caaaa taggggttcc	5700
gcgcacattt ccccgaaaag tgccacctga cgtc	5734

<210> 6
 <211> 30
 <212> DNA
 <213> Artificial sequence
 <400> 6
 cgctgacgtc gtgggccgtg ccagaggccc

30

<210> 7
 <211> 30
 <212> DNA
 <213> Artificial sequence
 <400> 7
 ggccaagacg tctgcagcat ggggcgtcac

30